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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary**Application No.**

10/583,336

Applicant(s)

SAKURAI, TETSUO

Examiner

TRANG Q. TRAN

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2008.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6, 7 and 9-12 is/are pending in the application.
4a) Of the above claim(s) 9 and 10 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-3, 6-7, 11-12 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SI-08)
Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2 and 6-7 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ota et al. (6,442,184) in view of Steigerwald et al. (2004/0113163).

Re. claim 1, Fig. 3 of Ota discloses a Group III nitride semiconductor device comprising a substrate (1+2), and a plurality of Group III nitride semiconductor layers (3+4) provided on the substrate (11), wherein a first layer (3) which is in contact with the substrate (1+2) is composed of silicon-doped $\text{Al}_x\text{Ga}_{1-x}\text{N}$ and has a structure formed of aggregated columnar crystal grains (as seen in Fig. 1).

Ota may not explicitly teach the following limitations whereas Fig. 2C of Steigerwald teaches it is known in the art to provide a first layer (37) is composed of silicon-doped $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 < x \leq 1$) (¶13, Ota teaches the first layer (37) is AlGaN layer with an Aluminum composition between about 50% to 100% and is doped with Silicon) and has a structure formed of columnar crystal grains having a width of 10 to 100 nm (0.06 micron = 60 nm).

It would have been obvious to one of ordinary skill in the art at the time of invention was made to provide the composition and width of the first layer of

Steigerwald in Ota, in order to scatter light out of the device (§14 of Steigerwald).

Re. claim 2, Ota and Steigerwald disclose the Group III nitride semiconductor device according to claim 1, Ota and Steigerwald may not explicitly teach wherein the first layer contains silicon in an amount of $1 \times 10^{17}/\text{cm}^3$ to $1 \times 10^{17}/\text{cm}^3$.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the first layer contains silicon in an amount of $1 \times 10^{17}/\text{cm}^3$ to $1 \times 10^{17}/\text{cm}^3$ because it is a standard doping for Silicon.

Re. claim 6, Ota and Steigerwald disclose the Group III nitride semiconductor device according to claim 1, Steigerwald discloses the wherein the first layer (37) has a thickness of 60 nm (Steigerwald discloses the first layer (37) has the thickness (height) between 0.06 micron (60nm) and 1 micron (1000 nm) which includes the claimed range).

Re. claim 7, Fig. 1 of Ota discloses a Group III nitride semiconductor light-emitting device comprising a substrate (1+2); an n-type layer (4+5), a light-emitting layer (6), and a p-type layer (8), which are composed of a Group III nitride semiconductor single crystal (3) and are provided on the substrate (1+2) in this order; a negative electrode (§168) provided on the n-type layer (4); and a positive electrode (§168) provided on the p-type layer (18), wherein there is a layer (3) composed of $s \text{ Al}_x\text{Ga}_{1-x}\text{N}$

in contact with the substrate (1+2) has a structure formed of aggregated columnar crystal grains (as seen in Fig. 1).

Ota may not explicitly teach the following limitations whereas Fig. 2C of Steigerwald teaches it is known in the art to provide a first layer (37) in contact with the substrate (32+35) is composed of silicon-doped $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 < x \leq 1$) (§13, Ota teaches the layer (37) is AlGa_N layer with an Aluminum composition between about 50% to 100% which is $0.5 \leq x \leq 1$ and is doped with Silicon) and the first layer (37) in contact with the substrate (32+35) has a structure formed of columnar crystal grains having a width of 10 to 100 nm (0.06 micron = 60 nm).

It would have been obvious to one of ordinary skill in the art at the time of invention was made to provide the composition and width of the first layer of Steigerwald in Ota, in order to scatter light out of the device (§14 of Steigerwald).

Re. claim 11, Ota and Steigerwald disclose the Group III nitride semiconductor device according to claim 1, Steigerwald discloses wherein the first layer (37) is composed of silicon-doped $\text{Al}_x\text{Ga}_{1-x}\text{N}$ (x is between about 50%-100%, $0.5 \leq x \leq 1$).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide certain claimed ranged of aluminum composition, since it has been held that discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); *In re Huang*, 100 F.3d 135, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996).

Re. claim 12, Ota and Steigerwald disclose the Group III nitride semiconductor device according to claim 1, Steigerwald discloses wherein the layer (37) in contact with the substrate (32+35) is composed of silicon-doped $\text{Al}_x\text{Ga}_{1-x}\text{N}$ (x is between about 50%-100%, $0.5 \leq x \leq 1$).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the layer having a certain claimed range of aluminum composition, since it has been held that discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); *In re Huang*, 100 F.3d 135, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996).

Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ota et al.

Re. claim 3, Fig. 1 of Ota discloses a Group III nitride semiconductor device comprising a substrate (1+2), and a plurality of Group III nitride semiconductor layers (3+4) provided on the substrate (10), wherein a first layer (3) which is in contact with the substrate (1+2) is composed of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ (Col. 4, lines 56-68).

Ota may not explicitly teach the difference in height between a protrusion and a depression which are present at the interface between the first layer and a second layer provided thereon is 10 nm or more and is equal to or less than 99% the thickness of the first layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide certain claimed ranges of aluminum composition, since it has been held that discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); *In re Huang*, 100 F.3d 135, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996).

Response to Amendment

Applicant's amendment to the claims, filed on April 23, 2008, is acknowledged. Entry of amendment is accepted and made of record. Currently, claims 1-17 are pending in light of the amendment, in which: claims 1, 7 and 9 were amended; claims 4-5 and 8 were cancelled; claims 9-10 were withdrawn; and claims 11-12 were added.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRANG Q. TRAN whose telephone number is (571)270-3259. The examiner can normally be reached on Mon - Thu (9am-5pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/T. Q. T./
Examiner, Art Unit 2811
/Cuong Q Nguyen/
Primary Examiner, Art Unit 2811